THE ELECTRICAL WORLD

VOL. III.—No 12. NEW YORK, MARCH 22, 1884. $2 PER ANNUM. 5 CENTS A COPY.

The Pilsen Electric Lamps.

While electric lamps have been undergoing a process of development at the hands of American inventors and assuming the various forms under which we find them

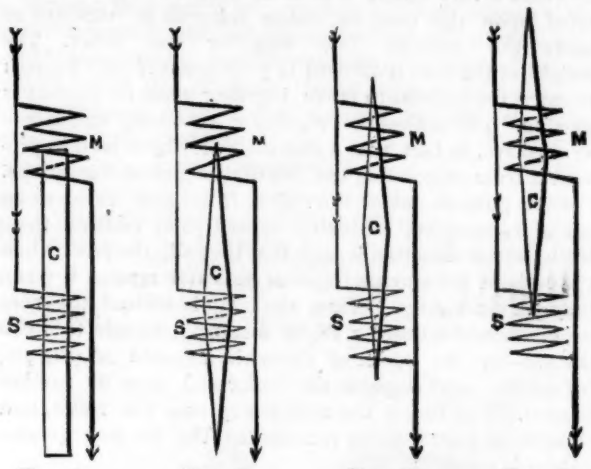


FIG. 1. FIG. 2. FIG. 3. FIG. 4.

used in this country a similar evolution has been progressing in Europe, and the efforts of inventors there, to improve, have led to an equally interesting diversity of types of arc regulators and incandescent lamps. Some of these types of lamps have proved very successful and

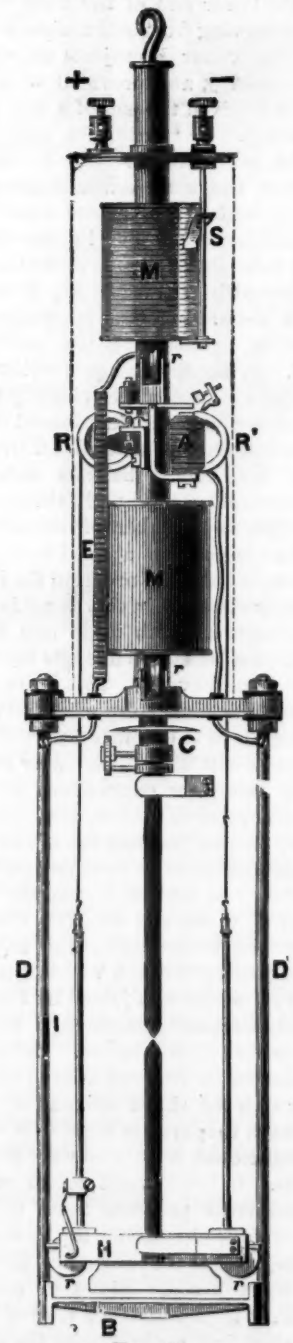


FIG. 10.

have become extensively adopted in various parts of Europe. However, no effort seems to have been made, except in very few cases, to introduce them here, and it is perhaps for this reason that they have failed to receive from electric light engineers and capitalists on this side of the Atlantic the attention to which they are entitled by the well-established reputation they enjoy abroad. Many of these lamps are only known to us by name and by the reports of their success at the various electrical expositions. We are therefore glad of an opportunity to gratify the curiosity of American electricans by presenting descriptive details concerning the "Plisen" arc lamp, which is specially interesting both from its peculiarities of construction and from its perfection of working, which has made it one of the most famous of European arc lamps. Mr. Alfred Pfannkuche, of the Pilsen, Joel, and General Electric Light Company, London, is now in this city exhibiting some of these lamps, and we have availed ourselves of his kind invitation to examine their construction

FIG. 12.

and test their working. Mr. Pfannkuche is also exhibiting the Pilsen incandescent lamp and the Joel "incandescence-arc" lamp, both of which we likewise took occasion to study. The Pilsen arc regulator was invented by two Austrian engineers, M. M. Ludwig Piette, and Franz Krizik, of Pilsen, a town in Bohemia, from which it takes its name. This regulator, which has been adapted to various forms of lamps intended for different purposes, is properly of the "differential" description since its operation depends upon the "differential action" between two magnetic forces acting in opposition to each other, the forces in this case being derived, the one from a solenoid in the main circuit, and the other from a solenoid in a derived circuit around the arc. The principle of construction by means of which such differential action is utilized in maintaining the arc of uniform length in this lamp may be said to differ radically from that of all other differential arc lamps, however, inasmuch as the use of all clockwork or clutch "feed mechanism" is dispensed with. In this case a different rôle is assigned to the motion produced in the armature or armatures by differential action; this motion is communicated directly to the carbons themselves, instead of being used merely to operate or regulate a feed mechanism. Of course it will be evident that since the carbons

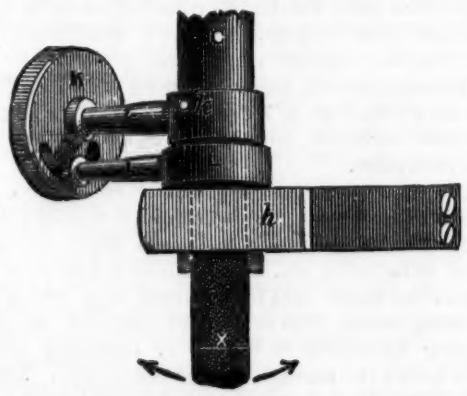


FIG. 13.

are fed by the motion of the armatures themselves the range of motion required of the armatures under the circumstances is exceedingly great, being, in fact, equal to the length of one of the carbons and sometimes of both. Not only this, but since the regulation must be uniformly accurate as the carbons burn, the "differential action" by which the motion of the armature or armatures is produced must remain the same at all points of their motion. Therefore the magnetic effort exerted by each solenoid on its armature, or portion of armature, must be the same for all points of the motion. MM. Piette and Krizik have succeeded in realizing these requisite conditions by giving to the armatures a form such that their *magnetic mass* decreases gradually at the ends which move into the solenoids. It is this innovation that constitutes the special feature of this regulator, and herein also lies the secret of its simplicity and accuracy.

When a rod of iron is moved inside a solenoid, through which a current is passing, it is attracted or "sucked" inward, the attractive effort increasing gradually until the end of the rod reaches the middle of the solenoid. After this the attraction diminishes regularly, and it ceases entirely as soon as the rod projects equally at either end of the solenoid. The explanation of this is, simply, that a

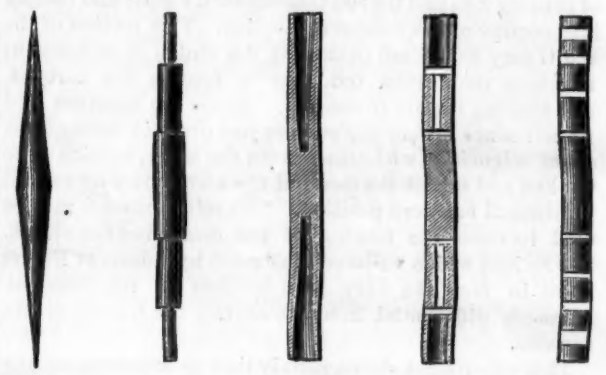


FIG. 5. FIG. 6. FIG. 7. FIG. 8. FIG. 9.

solenoid tends to attract inward from either end, and that the portion of the rod which has passed beyond the middle is now pulled backward, and the greater the mass of magnetic metal which thus becomes transferred to the other end of the solenoid by the motion of the core, the greater the "back pull" becomes until, finally, the two attractions balance each

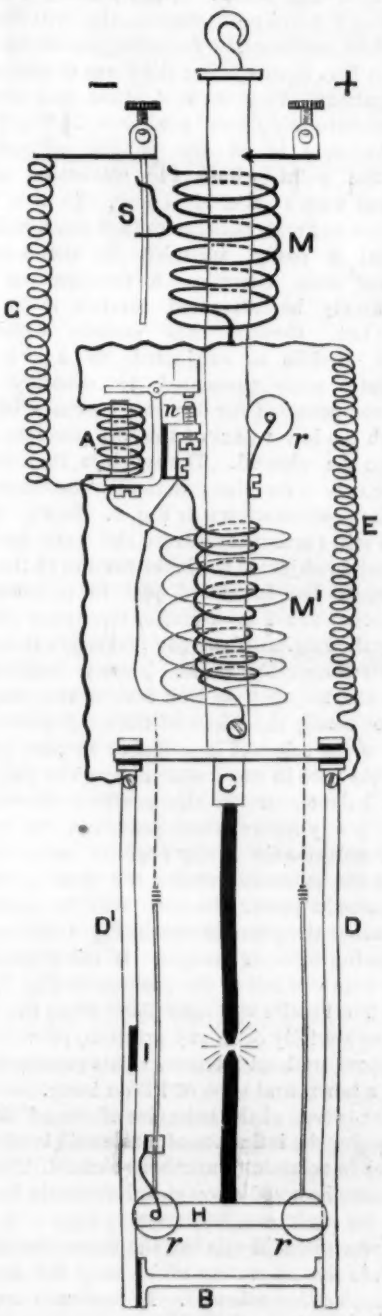


FIG. 11.

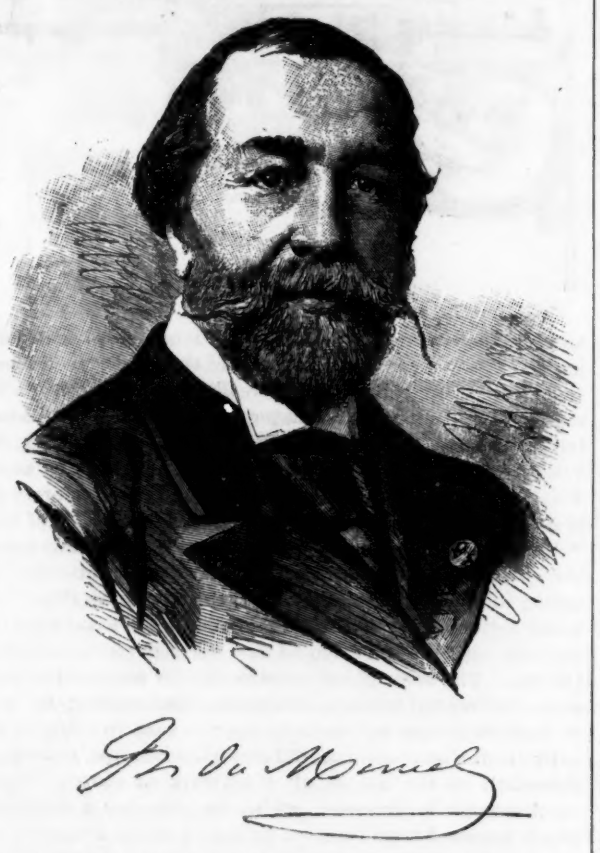
other. Now if this attraction, pulling the core, were obliged to overcome a certain opposition, like the weight of the rod itself, for instance, the further motion of the rod, after its end reached the middle of the solenoid, would cease as soon as the attractive power became

diminished enough to be resisted by the weight of the rod. The rod would stop and remain suspended at this point, its weight just balancing the attractive power of the solenoid. On adding weight the rod would descend and find a new balanced position; but on removing the weight it would immediately regain its original position. We may replace the additional weight by another solenoid at the lower end tending to pull the rod downward, and for every change of power in the lower solenoid a new balanced position will be assumed by the rod, though it will at once return to its original position when the lower solenoid is removed or weakened. In Fig. 1 we have such an arrangement shown, the iron rod *C* occupying a balanced position between two solenoids *M* and *S*. If we consider *M* the main circuit solenoid and *S* the shunt solenoid of an arc regulator we can study the effects of change. The current in *M* is supposed to be maintained nearly constant, but that in *S* varies inversely as the resistance of the arc. As long as the arc remains of the same length, or resistance, the rod *C* maintains the same balanced position; but when the arc lengthens more current is diverted through the solenoid *S* with the effect of causing it to pull the rod *C* downward a little and forcing it to occupy a new balanced position. This motion of the rod *C* may be utilized in causing the clutch or escapement to release the carbon rod, thereby feeding the carbons, and causing the arc to shorten. As the arc shortens and its resistance lowers the current just diverted through the shunt solenoid is withdrawn from the latter, causing it to weaken and release the iron rod *C* which moves up toward its original balanced position. This return motion may be used to cause the locking of the escapement or clutch. The actions which we have illustrated by means of Figure 1 are in fact the very ones utilized in the Siemens-Alteneck differential lamp, to control the feeding of the carbons.

This experiment shows plainly that an armature of uniform cylindrical or square section like that just used (*C*) could not be attached to the carbons directly, because, just as soon as the normal electrical ratio between the main and shunt solenoids is regained it moves back to its original position, and this would cause the carbons to be separated anew. Beside, as the shunt solenoid never pulls the iron rod down very far, the range of motion thus obtained would be limited to an inch or less, after which further feeding of the carbons would stop. We will now suppose the cylindrical core to be replaced by one tapering from the middle to either end, as shown in Fig. 5, this being the form of core used in the Pilsen regulator. Figs. 2, 3, 4 show this double-coned core or armature in different positions. In Fig. 2 the upper end of the core is at the middle of the solenoid, which is the point where the attraction exerted by *M* is greatest with a cylindrical core. In this case, however, it is not as great, because only a small mass of magnetic metal is really included in the solenoid. In Fig. 3 the core occupies a position in which it would scarcely be attracted further if it were cylindrical; but, though that portion which projects above the middle is subjected to a "back pull," the magnetic mass presented to contrary attraction is exactly compensated for by the increase of magnetic mass which the lower part of the core presents as it enters further into the solenoid. The result is that the upward pull on the core *C* remains practically the same as it was when in the position shown in Fig. 2. In Fig. 3 the core has moved still further, and from the very fact that the mass of metal subjected to the attraction of the lower half of the solenoid has increased just in proportion as the mass subjected to the back pull of the upper half has increased by the motion of the core, it results that the attractive effort remains the same. Thus it appears that the attraction exerted upon an iron core of this shape remains uniform for nearly the whole of the conic portion. If the attraction of the solenoid is sufficient to just balance the weight of the core in the position shown in Fig. 2, it will also just balance it in the position shown in Figs. 3 and 4, or in any intermediate positions. In other words the core *C* will remain in any position where it is placed as long as the solenoid retains the same power. If the solenoid gains in power the core will be pulled upward until it reaches the point shown in Fig. 4, unless restrained by an opposing force or weight. If the solenoid loses in power the core will fall to the position in Fig. 2, unless restrained. The results will take place when the solenoid is disposed horizontally or in any position, provided the core is free to move without friction. This principle is, in fact, applied in a horizontal type of Pilsen lamp.

Whatever is true of the behavior of one of the cones of this core under the influence of a solenoid is of course true of the other in relation to another solenoid. The same core may therefore be acted upon simultaneously by two solenoids, one for each core, as shown in Figs. 2, 3, 4. In this case the lower solenoid *opposes* the upper one as in Fig. 1, and *it will do this no matter which way the currents circulate through either solenoid.* In fact each core is acted upon independently, and the two cones might be separated by cutting the core in two, and interposing a joint of non-magnetic material. Indeed these cores are entirely apart in the latest form of lamp. This is an important point to remember, as it might at first occur to the observer that one solenoid opposes the other by "demagnetizing" the core, as is the case in many other arc regulators. Each solenoid opposes the other by a counter pull, exactly as it would if replaced by a counterbalancing weight.

Supposing this double core to form part of an arc regulator with main circuit solenoid *M* acting upon one core and shunt solenoid *S* acting upon the other, we can analyze the effects of differential action between the two solenoids. When the current begins to pass through *M* (Fig. 2), the core is attracted upward, but as the arc is formed, current passes through *S*, and the action exerted upon its cone soon balances the attraction produced by the main solenoid. If the core already occupied the position shown in Fig. 3, the current in *M* would have pulled it upward as strongly, for, as we have explained, the attraction is exerted uniformly upon the core when it occupies any position ranging from that in Fig. 2 to that in Fig. 4. For the same reason the opposing action of the solenoid *S* would be felt just as readily and to the same degree in any of these positions. The moment the two forces balance each other the core stops moving, and it stays in that position as long as the balance remains undisturbed. If the arc increases in length, the power of the shunt solenoid *S* is increased and it pulls the core down. This motion stops again the instant the arc regains its normal length for the shunt thereby weakens in power until the two solenoids are balanced as before. This motion of the core could be made to feed the carbons of an arc lamp directly, and the arc would be maintained of exactly uniform length as the core moved from the position shown in Fig. 4 to the position in Fig. 2, or for a range equal to nearly one-half the length of the core, provided that the solenoids are placed at a proper distance



apart, as shown in these figures, so that when the core is as in Fig. 2 the lower limit of uniform attraction is reached for both cones, and likewise with the upper limit when the core is in the position shown in Fig. 4. Other forms of core than the double coned one may be made to answer the same purpose. The only requirement necessary is that the magnetic mass should gradually be diminished toward the ends, either by boring or by turning. The forms shown in Figs. 6, 7, 8, 9, will also give a long range of uniform attraction, but the double cone form has been found preferable.

Fig. 12 shows the simplest practical application of this principle of regulation. This horizontal type of Pilsen arc lamp is intended for use in buildings where the ceilings are low, in factories, etc. Only one of the carbons is fed, the outer one being held by a pivoted arm which allows of its being swung from side to side only for the purpose of placing the carbons in line or of removing the brass tube to which the movable carbon is attached. This brass tube receives its motion from a biconical iron core inclosed within it which is acted upon by the two solenoids. It slides through both these solenoids between guiding rollers, which also serve to convey the current to the carbon. The operation of this lamp will be readily understood from what we have already said. If the carbons are in contact when the current is sent through, the main circuit solenoid will attract the core so as to separate the carbons and establish the arc, the motion being stopped by the shunt solenoid as soon as the arc attains its normal length. As the carbons consume and allow the arc to lengthen the shunt solenoid gains sufficient power to overbalance the main solenoid and the core moves back until the arc is of the proper length, whereupon the shunt loses in power enough to be balanced by the main circuit solenoid. Thus the feeding proceeds until the carbons are entirely consumed. If the carbons are not in contact at the time of starting the current will all pass through the shunt and thus cause them to move together. If desirable a slight inclination from the horizontal may be given to the tube so that it will slide and form the contact.

Fig. 10 shows a vertical type of Pilsen lamp which has become extensively used in Europe. This lamp presents many ingenious features. In this case the biconical iron core is enclosed in a brass tube and slides between guiding rollers as before, but it is disposed vertically instead of horizontally and it moves both carbons. The upper carbon is held by a clamp on the lower end of the core tube and moves with it. The motion of the lower carbon is caused by cords attached to the tube and passing over pulleys *R R'*. The lower carbon holder *H* which can move up and down between the rods *D D* is hung to these cords by means of hooked metallic rods, projecting upward. These rods are used because the heat of the arc would be likely to scorch the cord. From this arrangement it is seen that as the core moves upward, carrying with it the upper carbon, it causes the lower carbon to descend. The weight of the lower carbon holder is made sufficient so as to counterbalance almost entirely the weight of the core and tube, and thus a very slight degree of magnetic influence exerted upon the core by either solenoid is sufficient to move the carbons one way or the other. The weight of the core is allowed to preponderate only enough to cause the carbons to move together when no current is passing. This makes the regulator extremely sensitive—so sensitive, in fact, that a checking device is used to prevent it from responding too readily to current fluctations. For this purpose one of the rollers *R* has fine teeth cut on one of its margins; a small weighted pawl rests on these teeth, whose direction is such that they slip the pawl when the carbons are moving together but catch against it when they are separating. When the lamp is started the core is only moved upward a slight distance, enough to form the arc—by the power of the main solenoid *M* (Fig 10.) before the pawl engages the roller and stops its further motion. This forces the cord to slip over the roller, and thus the motion tending to lengthen the arc to a greater extent is resisted.

The carbons are held in place by spring clips. The upper carbon is susceptible of movement laterally for the purpose of bringing it in line with the lower carbon. This is provided for by a simple and ingenious device shown in Fig. 13. The spring clip *h* holding the upper carbon is in one piece with the collar *L*. This collar is pivoted at *k* to a collar piece on the lower end of the core tube in such a manner that it can swing from side to side, as shown by the arrows. From the collar *k* projects an arm carrying a milled head free to turn, and provided with an eccentric slot into which is received the end of a pin *L*, projecting from the carbon clip. By turning the milled head the pin *L*, sliding in the eccentric slot can be made to swing upward, by which the carbon would move to the left, or downward, by which the carbon would move to the right. This provides adjustment in two directions only, but as the core tube itself can be moved around the adjustment can be readily effected in any direction.

The length of the arc in these lamps can be varied by loading the core or by changing the power of the main circuit solenoid. In the first lamps constructed after this pattern, a novel device was used whereby the number of turns of wire utilized in the main solenoid could be varied at will. The insulation was scraped off the wire, so as to form a ridge of bare copper half an inch wide, and by means of a contact spring *S* (Fig. 10), the connection could be made to include any number of the turns on the solenoid. This device is not now applied to the Pilsen lamps, however, as there is but little occasion for its use.

An interesting peculiarity in this lamp is that the shunt solenoid (*M'*) consists of both large and fine wire. The large wire being first wound in a single layer, and the fine wire being then wound over it. This layer of large wire is intended to operate in connection with a novel "automatic cut-out," in which case it becomes a part of the main circuit. These results will be understood by reference to Fig. 11, in which the complete connections of the lamp are shown. From the positive binding post the current goes to the core tube, passing through the arc to the lower carbon holder, where the current finds two paths, one through the left-hand roller *r* to the rod *D'*, and the other through the right roller *r* to the rod *D*. The current from the rod *D'* passes from a connection at the top to the cut-out magnet *A*, after passing through which it goes to the main circuit solenoid *M*, where it is joined by the current from the rod *D*, which has passed through a resistance coil of iron wire *E* to arrive at this point. At the same time a portion of the current is diverted around the arc from the core tube *C* through the shunt solenoid *M'*. The current first passes through the layer of large wire whose outer end is in electrical connection with a contact screw *n* insulated from the cut-out. In the normal action of the lamp the derived circuit current proceeds from this through the fine wire of the shunt, circulating in the same direction as in the large wire, so that the magnetic effects of both the large and fine wires become added to each other. The current then passes to a resistance wire of German silver, *G*, which is in electrical contact with the core of the cut-out magnet, and thence, out by the negative binding post.

The cut-out is intended to operate when the carbons are burned out, or when there are none in the lamp. The armature of the cut-out magnet is pivoted as shown in the figure, and it is counterbalanced by a weight which causes it to make contact with the screw *n* when no current passes

through the cut-out magnet *A*. If there are carbons in the lamps the magnet *A* attracts this armature the moment the current is put on, and the currents follow the paths just described. Now, when there are no carbons, or only short ones, in the lamp, the lower holder *H* occupies a position nearly half way up between the guide rods *D D'*, and in this situation the left-hand roller *r* touches an insulated piece *I*, inserted in the rod *D'*. Consequently the current when passed through the lamp will not divide at the lower holder *H*, but will all pass through the resistance *E*, and no current will pass through the cut-out magnet; or if only short carbons remain, the lamp will operate normally until the carbons are burned sufficiently to let the left roller *r* come in contact with the insulated piece *I*, when instantly the cut-out magnet *A* will be excluded from the circuit.

As soon as the cut-out magnet *A* is cut out from the circuit its armature falls and establishes contact with the screw *n*, instantly forming a circuit that shunts the arc, the current passing from the positive pole (+) to the core tubes, through the layer of large wire of the shunt solenoid to the contact screw, through the core of the cut-out magnet, and thence through the German silver resistance *G* to the negative pole, this resistance being enough to make the total resistance equal to that through the arc when the lamp is working normally. * * *

[TO BE CONTINUED.]

Electric Lamps and Regulators.*

BY DR. N. S. KEITH.

(*Continued from page 77.*)

The Brush lamp may be said to be "electrically differential," and the Hefner-Alteneck lamp to be "magnetically differential." The former depends upon the differences in electrical effects of two circuits, resulting in variations in amount of free magnetism of an iron core. The latter depends upon the differences in the magnetic opposing attractive powers of two solenoidal circuits, resulting in the overcoming of one by the preponderance of the other through the medium of an iron core.

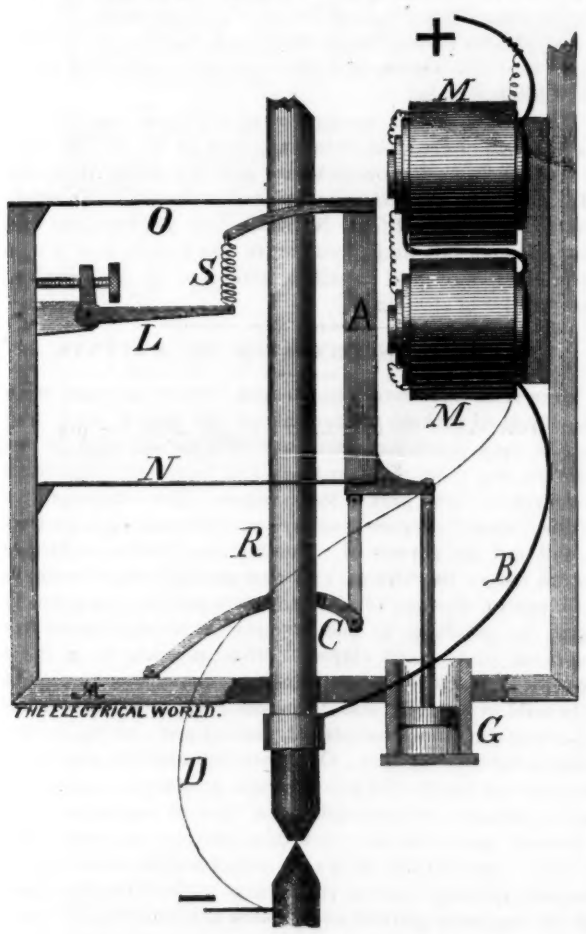


FIG. 25.

Figure 25 shows the working parts of one of Weston's differential lamps, made by the United States Electric Lighting Co. It is the one so well known in our shops and thoroughfares. The clamp lever *C* is lifted by the upward movement of the armature *A*, resulting from the attractive force of the differentially-wound electro-magnet *M M*. The speed of this movement is controlled by the piston in the dash-pot *G*. The clamp-lever *C* has a circular hole in it in which the carbon-carrier *R* slides when permitted so to do by a downward movement of the armature *A* which, through the connecting link, moves *C* so that its grip upon *R* is released. *O* and *N* are thin strips of metal which act as flexible arms to support the armature *A*. *L* is a lever which, through the movement of its set-screw, adjusts the tension of the spiral spring *S*, which determines the pull against the attractive force of *M M* and the regulation of the feed of the lamp. Each limb of the electro-magnet has three courses of insulated wire upon it. First is a large number of courses of fine wire next to the core. Upon this fine wire is wound a number of convolutions of coarse insulated wire; and upon this latter another large number of convolutions of fine wire are wound. The several fine-wire coils are connected together in series and so that the current which flows in them has a direction opposite to that of the coarse-wire, the two bobbins of which, on the two cores, are connected in series. The current enters at + and divides between the fine-wire and coarse-wire circuits; that through the coarse wire goes through *M M* and *B* to the arc, lower carbon and out at —, while that through the fine-wire goes through *M M* and *D* to the coarse-wire at — without entering the arc. The vertical movement of the armature *A* and lifting of the clamp and carbon-carrier is the resultant of the angularly exerted force of attraction of *M M* and the horizontally retentive power of *O* and *N*. The principle is the same as in the previously described differential lamps. The flow of current in the fine-wire decreases the magnetism of the electro-magnets and allows the downward movement of armature, link and clamp till the carbon-carrier slips in the feed-movement.

Figure 26 illustrates the Fuller Electrical Co.'s well-known lamp. This is the invention of that company's electrician, Mr. James J. Wood. Its principle is the same

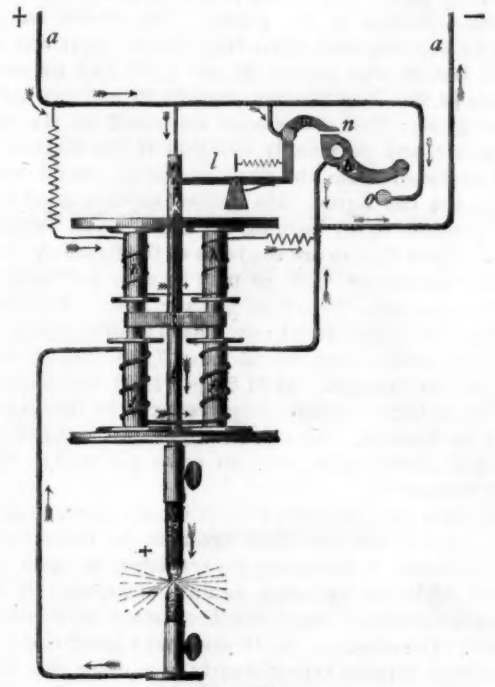


FIG. 26.

as that of the Hefner-Alteneck lamp, fig. 23. The cores of the electro-magnets are joined together in form like a letter H, of which the cross-bar is represented at *i*. This core is attached to a frame carrying clock-work mechanism which is actuated by descent of the carbon-carrier *e*. The clock-work is caused to engage and disengage with a detent by the downward and upward movement of the core. The electric current enters at + *a*, and divides :—the main part flowing through the carbon-carrier *e*, the + carbon, the arc, the — carbon, the solenoid *f f*, and out at *a'* —; the current through the fine wire circuit of high resistance takes the most direct course from + to — through the coils of *h h*. When current is started *f f* pull *i* downward and through the frame of the clock-work raise the carbon-carrier and the + carbon to form the arc.

As in the previously described cases, the solenoids *h h* act in opposition to the solenoids *f f* with a strength in proportion to the difference of potential between + and — due to length of arc. Then *i* is raised by preponderance of attraction of *h h*, the clock-work is disengaged from the detent, so that the feed movement can take place. In this lamp is seen a feature which we have not heretofore considered. I refer to a cut-out which works automatically to make a short-circuit around the lamp whenever, from any reason, the arc becomes very much too long. If the carbon-carrier should not move downward, the arc would become dangerously elongated owing to the consequent increase of difference of potential between + and —, and the great flame which is created thereby at the arc. This condition oftentimes creates short-circuits within the works of the lamp, and, as well, endangers surrounding objects by fire. When the arc thus becomes too long *i* is lifted still higher, and until a vertical rod *K*, which is attached to *i*, touches the lever *l*. This touching releases the bent lever *m*, so that it touches *b* at *n*, and thus completes a short-circuit from *a* + through *m n* and *b* to *a'* —, and the current takes that course to the exclusion of the course through the carbons. The lever *b* may be moved by hand, so that its small end rests on *o*. Then the short-circuit is through *o* and *b* to *a'* —. The arrows on the figure show the directions of the currents quite plainly.

Various forms of cut-outs have been made, and they are embodied in all the practical lamps of the day. This illustration in fig. 26 serves to illustrate the principle which they are under, namely, that of closing a previously open circuit around the lamps by extraordinary attractive strength of electro-magnets in a circuit of high resistance derived around the arc. In some lamps this is done by the electro magnet which effects the feed, and in others by a special electro-magnet.

Figure 27 represents the principle of the so-called Pilsen lamp, which is the invention of Messrs. Krizik and Piette, of Pilsen, Austria-Hungary. The novel feature in this lamp is the shape of the magnet-core operated upon by the two solenoids, which are presented to the core somewhat after the manner of the Hefner-Alteneck lamp, fig. 23. The inventors seem to have discovered the fact that a cone-shaped iron core is attracted equally at all positions within a solenoid. *A* is a double cone-shaped iron core, which is fastened in the tube *B* of non-magnetic material. This tube serves also as a carbon carrier. The core is made as long as the length of the carbons, and, due to the property we have named, needs no clock-work, clamp or detaining mechanism, as the core remains in any position in which it may be placed under the normal difference in attractive power of the two solenoids.

When current is started, for the reason we considered in relation to figure 22, the solenoid *D* does not exert its full strength, therefore solenoid *C* overpowers it and moves *A* and its attachments upward until the length of arc and consequent flow of current in *D* has made *D* strong enough to balance the force of *C*. When the arc gets a trifle too long *D* exceeds in strength and therefore draws *A* downward. The feed of this lamp is practically constant.

Figure 28 represents the principle of a plan devised by Mr. William Hochhausen and used in the lamps made by the Excelsior Electric Co., of New York city. This lamp is not "magnetically differential," neither does it work by reason of reactions of two currents. *I* is a carbon-carrier which by its descent in feed gives rotary motion to the wheel *G*, which is mounted on the lever *F* which is pivoted at *f*. This lever is balanced by the spring *E*, which is adjustable in its tension by the screw *e*. *A* is an iron core which is freely movable vertically in the solenoid *B*, which is in the main circuit. When current is not flowing *A* rests upon *F* and so depresses *F* and the wheel *G* as to free the wheel from the detent *H* and allow *I* to move downward until the carbons touch. The iron core *C* is connected to the lever *F* by the link *c* and moves freely in the solenoid *D*, whose coils are in the shunt-circuit around the arc as shown by *S S*. When current is started *A* is lifted from *F*, and *E* raises *F* and the carbon-carrier and carbon to form the arc. But when the arc has become long enough to cause sufficient current to flow in *D*, the core *C* is pulled downward, and with it *F* and *G* are depressed until *G* is freed from detent *H*, and thus *I* moves downward in feed. As the current in *D* decreases from the approach of the carbons, *C* rises, being drawn up with *F* and *G* by the spring *E*, and *G* engages with *H* to stop the feed movement. It will be observed that the arc is formed by lifting the weight *A*, and that that performs no other office in the lamp. The feed is entirely controlled by the shunt-magnet or solenoid.

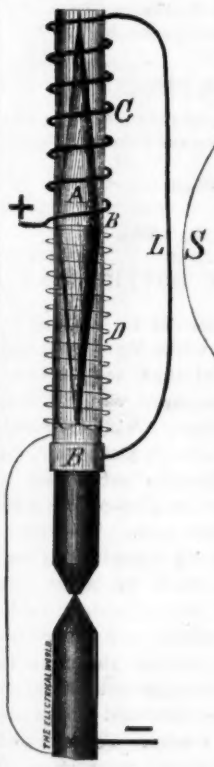


FIG. 27.

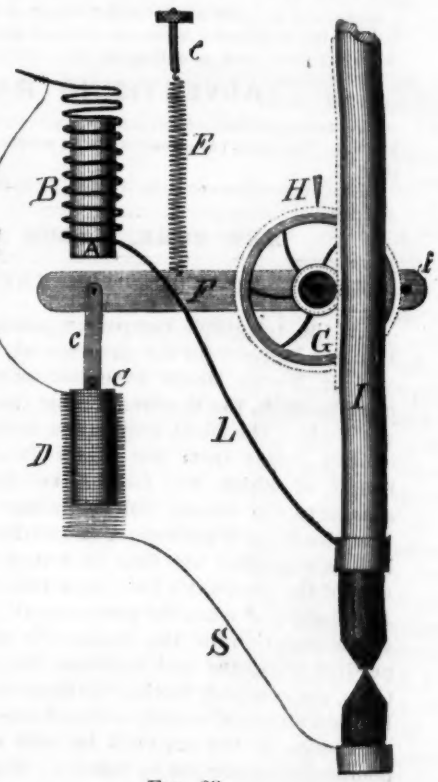


FIG. 28.

[TO BE CONTINUED.]

The Late Count du Moncel.

We gave on February 23, in our issue following his death, an obituary notice of the Count du Moncel. We now take the opportunity of supplementing that early review of his life, the first published in this country, with a fine portrait (page 90) of the great French physicist and electrician. Underneath is a fac-simile of his signature. *La Lumière Electrique* publishes the original from which we take the portrait. Count du Moncel was scientific director of that excellent journal.

A NEW ELECTRIC COMPANY.—A certificate incorporating the Monarch Electric Company was filed on the 14th in the County Clerk's office. The objects of the company are the development, use, manufacture and sale of electrical apparatus, appliances and machinery. The capital stock is fixed at $200,000, divided into 2,000 shares of $100 each. The corporators of the company are George E. Hall, Josiah L. Chapin and William Sutphen, who, with Walter K. Freeman and Cornelius Oakley, are the trustees for the first year.

* Lecture delivered before the New York Electrical Society, Jan. 16, 1884.

THE
ELECTRICAL WORLD,
PUBLISHED WEEKLY AT
No. 9 MURRAY STREET, NEW YORK.

W. J. JOHNSTON, - Editor and Publisher.

ASSOCIATE EDITORS.

C. O. MAILLOUX, - - - Scientific Department.
T. C. MARTIN, - - - - - News Department.
CLARENCE E. STUMP, Business Manager.

Mr. Mailloux, the expert of THE ELECTRICAL WORLD, writes for it exclusively. His articles are designated thus: *.*.

Articles in the preparation of which he has assisted, and the views and statements in which he therefore indorses, are marked, **.

Correspondence on all electrical subjects is solicited. Readers are cordially invited to communicate their views and opinions on all topics within the province of this journal. Items of information relating to any application of electrical science will be thankfully received. Our friends will render us a valuable service by forwarding news *promptly* as it occurs, and by mailing us marked copies of their local papers containing anything likely to interest our readers. Anonymous communications not noticed. Rejected manuscript cannot be returned unless accompanied by the necessary postage when received.

Correspondence other than of a business nature, should not be addressed to individuals, but solely to

"The Editor of The Electrical World, New York."

All communications relating to subscriptions, book orders, advertising, or of a business nature, should be addressed

W. J. JOHNSTON, Publisher, 9 Murray St. New York.

THE ELECTRICAL WORLD HAS
THE LARGEST CIRCULATION
Of any Electrical Journal in the World.

Postage to any part of the United States or Canada is always prepaid by the Publisher. Addresses changed as often as desired free. Always give the **old** as well as the new address.

ADVERTISING RATES,

Circulation considered, are lower than those of any similar first-clas journal. The price varies according to position and number of insertions.

Notice of Situations or Help Wanted, $1 to $3 per insertion.

NEW YORK, MARCH 22, 1884.

WILLING TO WORK FOR THE GOVERNMENT.

All the telegraph companies appear to be willing to transact business for the government, while Mr. Jay Gould and Dr. Norvin Green have intimated that, for a proper consideration, the Western Union Company would "sell out" to it. The latest proposition looking to government control comes from the Postal Telegraph Company, in behalf of which Mr. George D. Roberts submitted a scheme to the Senate Sub-committee on Post-offices and Post Roads, at Washington, on the 19th inst. The stipulations suggested are, that in return for a gradual extension of the company's lines, now estimated, we believe, at 15,000 miles of wire, the government shall furnish suitable accommodation for the company's offices, and accord all needful privileges and facilities for making the connections, the company having the right to construct telegraph lines on all postal routes, while all lines operated under the provisions of the act shall be post routes. The rates of compensation are put as follows: For each message of 20 words or less, exclusive of the date, address and signature, transmitted in the ordinary course of business between any of the places in the United States lying east of the Mississippi and Missouri Rivers and south of Omaha and Minneapolis, 25 cents, and 10 cents for each additional 10 words in excess of 20 words; and for each message directed to be transmitted at night and delivered the following morning, 15 cents, if of 20 words or less, and 10 cents for each additional 10 words or less in excess of 20 words, except that between the cities of New York, Philadelphia, Baltimore and Washington, and such other points, separated by short distances, as may be from time to time agreed upon. The ordinary services shall be paid for at the rate of 15 cents for each message of 20 words or less, as aforesaid, and 10 cents for each 10 words or less in excess of 20 words, the payments to be made monthly, as hereinafter provided. The same local rate is fixed between any points in the Western or Pacific division, but for all messages transmitted from any point in the Atlantic division to any point in the Pacific division the compensation shall be 50 cents for each message of 20 words or less and 20 cents for each additional 10 words or less for ordinary service, and for night service at 25 cents for each message of 20 words or less and 10 cents for each additional 10 words or less. Upon all the tariff rates above specified there shall be a deduction of 2 cents, or the local rate of postage if less than 2 cents, on each message as compensation to the Government for delivery. The contract shall remain in force 10 years from its date. The Postmaster General shall provide telegram stamps and stamped paper to be sold as postage stamps are now sold, of denominations corresponding with the several tariff rates. Upon every telegram delivered by authority of the Government to the telegraph company the proper stamp for full prepayment, including delivery, shall be affixed by the sender of the message. The telegraph company shall transmit telegrams in the order in which they are received, excepting night messages.

Mr. Roberts made great claims before the committee for the sextuplex now in use and for the improved compound wire, with the features of both of which our readers are acquainted. He stated also that his company proposed to do business outside its contract with the government.

ELECTRIC LIGHTING IN BOSTON.

There has been some talk in Boston this month as to the advisability of replacing electric lights along the streets by gas, on the score of economy. It is evident that a disposition exists on the part of various members of the common council to decry and antagonize the electric lighting system employed in Boston, and, of course, figures are not lacking to show that, in the interests of the citizens, gas, now cheapened by the competition of its young rival, should be used again to the practical exclusion of the electric light. But the public, so far as its sentiments can be ascertained, still favors warmly the electric light, and Mr. Edward H. Goff, President of the American Electric and Illuminating Company, has put the electrical side of the question in a very pertinent and cogent way in a communication to the papers. He makes one good point by showing that when the electric light was introduced, Boston was paying $2 per 1,000 feet for gas and citizens $2.80. Now the city pays $1.30 and private consumers $1.80. That is one boon conferred on the public. He asserts, and reasonably too, that if the electric light were excluded from the city, gas prices would soon go back to the old figure. He makes another good point: "An electric light, burning all night, costs exactly 65 cents. These figures are the basis of the figuring. One of the large gas lamps, such as may be seen in Charlestown square, consumes 100 feet of gas per hour. The average lighting time, according to the actual record, is 10½ hours. Thus the large lamp would burn 1,050 feet of gas per night on the average. At $1.30 per 1,000, this would cost the city $1.36 per night. It gives light to the extent of about 300 candles. An electric light, giving light to the extent of 1,600 candles, costs 65 cents per night. Which is the cheaper?"

We think that the shrewd, active and enterprising men at the head of electric light interests in Boston will be able to make a favorable report later, in spite of the present lobbying agitation against enterprises in which they have received every encouragement to invest their capital. The situation in Boston and a great many other cities was defined rather neatly the other day by Mr. Robert Hammond in England. He was asked by the director of a gas company: "Are you prepared to light five street lamps with electricity at the same price as gas?" He replied: "Yes, provided the gas company allows me also to do the remaining 250,000 lights, by the supply of which they are able to keep the cost of the five lights so low." That is the case as to price, in a nutshell.

ANOTHER SCHEME FOR UTILIZING NIAGARA.

Mention is made in the daily papers of the scheme of Col. Leonard Henkle, of Lockport, N. Y., who proposes to light sixty-five cities in this country and Canada from "central batteries" stationed at Niagara Falls, and run by the immense water power there available. The action of the State Commissioners condemning the land around the falls for an international park has, it is said, greatly disconcerted Col. Henkle's arrangements, but he asserts that new ones will be made and the work will certainly go on. On Sunday, the 16th instant, he received a letter from a Chicago banker who has, he says, taken $1,000,000 of the stock, stating that he was soon coming east to Baltimore, which city he would make his head-quarters. He will there take charge of the company and form a syndicate in New York city to go on with the work. Col. Henkle is now having a cottage built at Niagara Falls which will be ready for his occupancy in May, and he will then go there from Lockport to superintend the work of erecting buildings for the batteries and digging a canal to obtain the water power. By "batteries" we presume dynamos are meant.

Having generated his current, the sanguine Colonel proposes to transmit it by a silver wire, vaguely described to be "about the size of a straw." This wire is to be laid underground incased in heavy asphaltum pipes, and by its means a current from a "40-foot battery" is to be transmitted to Rochester, where it will be converted into light, sufficing for 12 hours. What is to be done with the current when the lights are not wanted, is not stated. It appears that the experiments with the apparatus are to be made at Lockport and Buffalo next fall, when by a properly constructed means for the conservation of electric energy he expects to overcome the resistance usually found in transmitting currents through long distances. Should Colonel Henkle succeed in getting for use 100 per cent. or even a little more, of the current generated, we trust he will let us have early intimation of the fact. Perhaps his friends have exaggerated his modest claims in this respect. We would suggest that although silver has a slightly higher conductivity than copper, it might bring the scheme a little nearer to the usual standards of commercial practicability to use copper as being much cheaper. The conductor could in that case still be of no greater diameter than "a piece of straw," and as it must certainly be longer than "a piece of string," great economy would be effected in the substitution of one metal for the other.

PRINTING NEWSPAPERS BY ELECTRICITY.

Last week we mentioned briefly that the Ilion (N. Y.) *Citizen* of the 14th inst. had been printed by electricity. We have before us now a copy of the paper, which, always in deserved local repute, has suddenly found itself widely famous, and from a critical examination we can say that the press work is excellent.

We believe this is the first time that electricity has ever been employed in running a printing press for a newspaper. Our French contemporary, *La Lumière Electrique*, was printed by electricity during the Exhibition at Paris in 1881, and at the time of M. Marcel Deprez's experiments in the transmission of energy at Grenoble a small printing press was worked by the electrical current; but we do not know of any other instances of the kind on record.

The story of the way in which the feat was accomplished is interesting. The large engine from which Mr. George W. Weaver, editor and publisher of the paper, obtained his motive power, broke down, and the printing office was crippled. No other engine was available. Mr. George M. Lee, a son of the inventor of the celebrated magazine rifle bearing his name, and engaged at the Remington Armory in the manufacture of Parker electric lamps and dynamos, suggested that the presses might be run by electricity, and Mr. Weaver was convinced by experiment that it could be done. A Parker dynamo used for electric lighting was connected with the main shafting in the Armory, and set in motion. Thence the current was conducted by wire in the usual way over the buildings and streets to the *Citizen* office, fifteen rods away, where it set in motion a Parker motor weighing about half a ton. On Thursday night at seven o'clock the dynamo was started, the shaft work in the printing office responded to the motion imparted, the three cylinder presses began their work, and in a very short time the whole edition of 3,000 copies was worked off without a hitch.

The thing is simple enough when it is done, but there is a great deal of credit in being the first to do it. Mr. Lee has made himself conspicuous, and we learn that the edition of the *Citizen* thus printed is already exhausted, another being called for. Naturally the achievement has evoked much talk and comment in the papers, and it will be productive of good in calling attention to the practical possibilities of electricity.

THE RAID IN CONGRESS ON PATENTS.

More than a score of bills are now before Congress with the object of making alterations in the patent laws, and should they pass immense injury will be inflicted on inventors, the owners of patents and large manufacturing concerns in every part of the country. The very enormity of the "steal" proposed inspires us with a strong hope that it will not be permitted. One bill now before the House would reduce the lifetime of a new patent from 17 years to 5, in utter contempt of the fact that patents very rarely bring in anything to the inventor or patentee until five years or more have elapsed. This measure is in itself enough to check invention fatally in many directions, but it is mild in its folly and injustice compared with other bills that the House has already passed and sent up to the Senate for concurrence. One provides virtually that if an inventor or owner of a patent seeks at law to sustain his rights, below a certain high value he shall recover no costs and shall pay to the lawyer of the infringer a counsel fee of $50. Another bill allows the use of any patented article without liability, except that when notification has been given the infringer can go on using the article after paying whatever royalty the courts may think fit to name. The worst proposition of all is in the bill introduced by Mr. Voorhees in the Senate, which makes it a valid defense to any action for an infringement of any patent, or in any proceeding to enjoin from use, that the defendant purchased the patented article for use or consumption, and not for sale or exchange in good faith and in the usual course of trade, without notice that it was covered by a patent or that the vendor had no right to sell; and in all such cases, the notice received after such purchase shall not in any way impair the right of the purchaser as absolute owner. Any one can see at a glance that this is inviting to plunder and confiscation.

Electrical inventors number their thousands in this country, and every industry connected with the electrical business is based on patents. If electricians and capitalists would therefore protect their property from thieves, and their inventions from pirates they must watch and oppose the hostile bills brought before Congress. Can there not be some united action on the subject?

EDISON STATION, PEARL ST., NEW YORK.—Workmen have begun to fit up the building adjoining the Edison Station in Pearl street for the reception of more dynamos, the demand for the light having long ago taxed the present capacity of the station to its utmost. There are now 150 applicants for light who cannot be served until the new station is ready. The present number of lamps fed from the Pearl street station is 12,000, of which about half are generally in use late in the afternoon. Upon one occasion last month 7,200 were lighted, the day being an unusually dark one. No more street mains will be laid until the supply of light equals the demand. With the new plant, which will be in operation within two months, 10,000 lights can be kept burning at once, which will allow connection to be made with at least 16,000 lamps, for not more than half the lamps are, as a rule, lighted at the same time.

The Brush Electric Light Station, Rochester, N. Y.

Considerable interest has been manifested of late in the application of water power to the production of electricity for motive and lighting purposes, and numerous inquiries are addressed to us on the subject. Many of our readers may not be aware of the fact that this country furnishes one of the most noteworthy examples of an electric light installation depending for the generation of the current on power derived from flowing water. It is that at Rochester, N.Y., of the Brush Electric Lighting Company, and so great has been its success that there is some excuse for the good citizen of Lockport, who, seeing the Genesee Falls utilized in this admirable manner, wants $20,000,000 for the purpose of utilizing the power of the great Horseshoe Falls at Niagara for electric lighting purposes all over the State of New York and in Canada.

We are indebted to Mr. G. A. Redman, superintendent of the company, for the details given, and the excellent illustrations are from *The Milling World*. The Brush works are situated at the Lower Genesee Falls, Rochester, about two and a quarter miles from the centre of the city, and on the west bank of the Genesee River. The building is of brick, 100 feet long, 42 feet wide, one story, having a height of 32 feet in the centre. There are nine girders which support the roof and the line shafting. On the shafting is a band wheel 5 feet in diameter, with 4 feet 10 inch face; also 15 sets of dead pulleys of 12 inch face, and they are so constructed and arranged that by one single and gradual movement of a double-headed oscillating cam, in connection with a belt shifter, the loose pulley which hangs on a hollow, independent bearing concentric with and surrounding the shaft without contact therewith, is thrown into gear and set in motion. Thus, as the cam is continuously moved forward through the extent of its parallel arc, which holds the loose pulley in gear, the belt is shifted on to it, when, by a little further movement of the cam, its inclined part at the rear end disengages the clutch, and the loose pulley, belt and actuated machines cease moving and remain idle until the cam is moved in the reverse direction, setting the idler in motion, shifting the belt into working position, and setting the machine in motion, when, by the inclined part of the opposite end of cam from that mentioned above, the clutch is disengaged and the idler is again at rest, out of contact with the running parts. In brief, this makes a very convenient set of pulleys for electric machinery. The pulleys were furnished by the Taper Sleeve Pulley Works of Erie, Pa. The power is obtained by using two Victor turbine water wheels, 20 inches in diameter, made by the well-known Stillwell & Bierce Manufacturing Company, Dayton, Ohio. To make a place for the flumes an open cut was made in the solid rock bank, 32 feet horizontal depth, 20 feet wide, and 36 feet deep, to a level with the bottom of the race. A shaft 12 feet square was sunk into the rock to a depth of 94 feet, the falls at this point being about 96 feet high. The two turbines develop 1,144 horse-power and make 582 revolutions per minute.

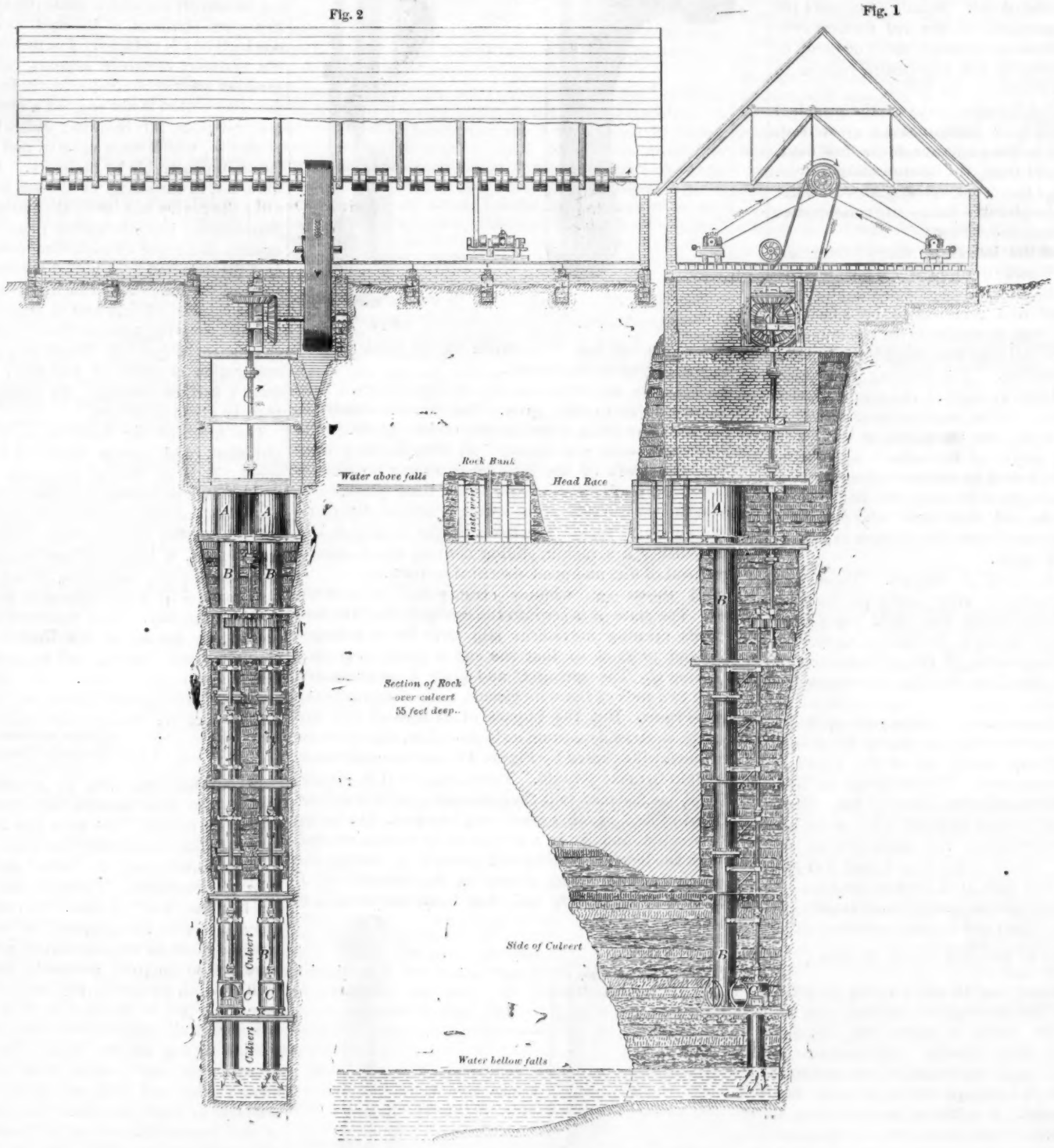
Figure 1 is a cross sectional elevation through the wheel and gear pit, viewed from the down-stream end. Figure 2 is a longitudinal section from the bottom of the wheel pit upward, seen from the land side of the works. For the following explanation of the lettering we are obliged to our contemporary.

"On the bottom of said recess in the rock, and partly over the shaft therein, is the flume, containing two U-shaped iron forebays, *AA*, seven feet high, opening toward the head race, and from the bottom of which are suspended two iron stand pipes, *BB*, 76 feet and 10 inches long by 42¼ inches in diameter, their upper ends opening into the forebays to receive water to supply the wheels. At one side of each stand pipe, and connected thereto with a short cylindrical tube, is an iron wheel case, *C*, with a draught tube attached to its bottom, and extending some ten feet downward, and entering the back water. One wheel case in each figure is partly broken away, to show the wheels. Besides the support to the stand pipes by their connection with the iron forebays, *AA*, they and the wheel cases, *CC*, are supported at their bottoms by iron beams, as shown in cuts. The turbines are placed in the wheel cases, *C*, and each one has about 58 feet of steel shafting, 3⅛ inches in diameter, coupled to it and supported by bracket bearings projecting from the stand pipes, *BB*. Each of said shafts has on it, near its top end, a spur pinion 21¾ inches in diameter by 17 inch face, 17 teeth, 4 inch pitch, machine dressed. These gear into a core spur wheel 69⅛ inches in diameter, having 54 wooden cogs, and which is hung on near the bottom of a steel counter shaft 6 inches in diameter and 60 feet long, on which, near its top end, is a bevel wheel 88 inches in diameter, 18 inch face, 55 teeth, 5 inch pitch, gearing into a core bevel wheel, 99.6 inches in diameter, with 56 wooden cogs, 18 inches wide. This wheel is on a short, horizontal shaft, 6 inches in diameter, having on its farther end, beneath the floor of the building, an iron spider carrying a wooden rim band wheel, 10 feet in diameter by 4 feet 8 inches face, carrying a rubber belt 4 feet 6 inches wide by three-eighths inch thick, which connects with the heretofore described five-foot leading band wheel on the main line of shafting above, and drives them."

To these interesting particulars, now published with the illustrations for the first time in an American electrical journal, we may add a few more about the station and lighting arrangements. All the circuit wires and machine wires are run in grooved boards to a large switch-board and by a system of plug-switches any circuit can switched on to any other machine in three seconds, as demonstrated on trial. The dynamos are placed on wooden platforms 2 feet high. All the public street circuits are run with a No. 7 and a No. 8 dynamo coupled, and all coupling is done at the switch-board. At present the company have in use four No. 7 (16 lights) eight No. 8 (40 lights), and three No. 8 (60 lights). The speed is: No. 7, 810: No. 8, 710; and No. 8, 880. The street lights are nearly all suspended in the centre of the street by means of a long iron crane, and hang about 18 feet from the ground. It is needless to say that the service gives satisfaction to the public. The Superintendent of the company, Mr. Redman, was formerly a director in another local company, and has been very successful in his present engagement.

Fig. 2

Fig. 1



THE BRUSH ELECTRIC LIGHT STATION, ROCHESTER, N. Y.

The Telephone War at Terre Haute, Ind.

It was very widely published by certain papers about a year and a half ago that the Telephone Company at Evansville, Ind., had been forced to reduce its rates of service by a combination of citizens. The same papers neglected to state, "as a matter of news," that the rates have since been restored, and are now really higher than before, while that exchange has now the largest number of subscribers it ever had, in spite of the large loss of a year ago.

So it has been at Terre Haute, Ind. The first few days in January it looked to those who were inexperienced in such matters as though the business of the Central Union Telephone Company in that city was seriously injured, if not ruined entirely. Some newspapers of the State did what they could to circulate the report. When, a few days later, the combination collapsed and the fight ended with the Telephone Company undoubtedly victorious very few of those papers said anything about it. If they did, the notice was as brief and obscure as possible.

For the benefit of our telephonic readers we have carefully compiled a brief but full history of the "war," one side of which has been made public by the newspapers in that portion of the country.

About the middle of last November it occurred to several citizens of that place that $60 a year for a business telephone and $36 for one in a residence was a little higher than the size of the town justified. As surrounding towns with but 50 or 100 subscribers were getting service for $48 and $36, they could not see why a subscriber to an exchange of 350 should pay more.

Business just at that time being a little dull, several gentlemen devoted themselves for six or eight weeks exclusively to the work of securing a reduction, determined, if it could not be secured, at least to injure the business and thus cut down the profits of the "blood-thirsty monopoly."

A petition was at first circulated, politely asking the company to reduce the rates. This, of course, was extensively signed. A meeting was held December 3, and was attended by about 75 citizens of all classes. The usual speeches were indulged in, and a committee of three was appointed to see what could be done.

This committee corresponded with the mayors of various cities and towns, and learned that the smaller towns enjoyed lower rates and the larger cities higher. A paper, by signing which the subscriber ordered the telephone company to remove his instruments January 1, 1884, un-

less the rates were reduced to $3 and $2 a month, was circulated. By various representations about 200 signatures were secured. Of these very few signed expecting to have the telephone taken out. They were assured by the committee that the company would certainly "cave in" at the presentation of such a formidable list of names.

The committee visited the general offices of the company at Chicago, December 26. They reported that they were well received and very kindly treated. They presented the petition and tried to convince the officers of the company that they would make money by reducing the rates. The officers in turn tried to convince the committee that it would result in actual loss. Two hours' conversation left all parties "of the same opinion still." As a "corker" the committee presented the list of those who threatened to discontinue unless rates were reduced. The desired effect was not produced, and the committee returned home. A meeting was immediately called. More resolutions and speeches were indulged in, and all present decided to have their telephones removed January 1.

On the morning of the 1st the company began taking away the instruments ordered out. Within a few days 120 were removed. The remainder of the 200 strikers concluded to retain their telephones, though many of them, in order to carry out the spirit of the agreement, refused to use their instruments while the strike lasted.

As the number removed included many of the principal business houses who used their instruments a great deal, things were rather quiet in the exchange for a few days. Loud complaint was heard from the surrounding towns, which were unable to get the usual connection with Terre Haute merchants. Considerable trade in consequence went to Indianapolis.

Seeing that, in spite of the loss of so many subscribers the "horrid monopoly" still lived, another meeting was called for Jan. 8 to devise further steps toward annihilation. It was announced that this was to be a business meeting. Everything was in readiness for the organization of a new company. All that was needed was to meet and complete arrangements. The meeting was consequently attended by a large number of the representative business men of the city. After an hour and a half of exhaustive eloqnence, some one suggested it was about time the meeting got down to business. Upon being pressed, the leaders were forced to acknowledge that the only telephones not infringements upon the Bell patents were acoustic telephones, and that those who could not get along without telephone service would have to patronize the present company again.

The meeting at once broke up in disgust. Those who had been led to believe there were hopes of securing another telephone were convinced that their hopes were groundless, for the present at least. Seeing no reason why they should deprive themselves of the convenience of telephones in the mean time, they resolved to resume the use of their instruments.

The company was as busy for a few days putting in instruments as it had been previously in taking them out. Before the 1st of February nearly all of the principal firms were once more connected. The exchange has now nearly as many subscribers as before January 1st. Those still out are mostly small dealers who had very little use for the telephone in the first place and made this an excuse for discontinuing. Some others do not need it at this season of the year and will wait until they do later on.

The exchange is in a prosperous condition, is rapidly increasing its list of subscribers, and is giving good service.

Devices Belonging to Burglar Alarm Systems.

Electrical appliances assist in the safe keeping of property and person against the rapacity and violence of criminals by furnishing the ounce of prevention, which is notice of attack before harm results. Combinations of devices for this purpose constitute burglar-alarm systems, and these must be made so nearly perfect in all their features that safety is assured. A doubtful burglar-alarm is either a source of unrest when so known, or when unknown a deceptive fraud, lulling to sleep the unprotected. Therefore anything which tends to certainty of action in any of these systems is important, even though it may be a simple mechanical contrivance to take the place of one more complicated, or less to be depended upon, for the performance of its function. In fact, the more simple the device may be, provided it executes its office, the better, for it is less liable to derangement.

Most burglar-alarm circuits are open ones and are operated by closing them at or near the source of danger or trouble. If the circuit-makers at these points are imperfect nothing but uncertainty or absolute failure results, and the false protector protects not. We have prepared some illustrations of door and window connections or circuit-makers for the purpose of pointing the moral. These articles are made at Rousseau's Electrical Works in New York city, and are designated by Figs. 1, 2, 3 and 4. Figs. 1 and 2 illustrate old styles and Figs. 3 and 4 new styles invented by Mr. Lucius J. Phelps.

Fig. 1, is a circuit-maker for a door. It is placed in the jamb of the door with the spiral spring within a recess in the wood and the plate *A* sunk in the wood flush with the face. The spindle which works within the spiral spring carries a collar *B*, which, when the door is open, bears upon the flat spring *C*, which is fastened to the plate, but electrically insulated therefrom. One of the circuit wires is attached to the plate *A* and the other to the spring *C*. When the door is closed the edge on which are the hinges presses the spindle inward and moves the collar *B* away from contact with *C* and so opens the circuit. But when the door is opened the spring forces the spindle outward, so the collar against *C* closes the circuit; and thus the alarm is rung by the electric bell in the circuit. But dirt, rust or corrosion may cause very imperfect contact between *B* and *C* at *D*, and the resistance be so very great

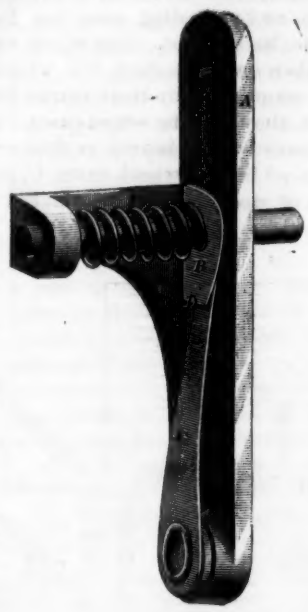


FIG. 1.

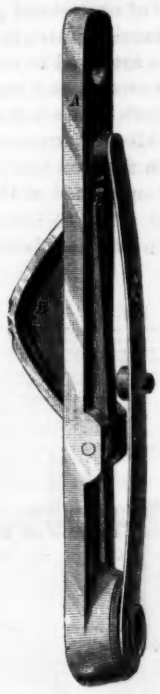


FIG. 2.

that the alarm will not be sounded by the weak current which would pass in the circuit.

Fig. 3 shows an improvement on this device. Like letters here refer to like parts. The changes consist, in the main, in providing a pin in the collar *B*, which pin makes contact with the spring *C* at *D* by bedding itself between the teeth of the bifurcated spring so that it touches both teeth, and at the same time presses two teeth on the reverse side of the spring *C* against the plate. The pin serves to spread the teeth of the spring, and in doing so makes a scraping, sliding contact which insures the removal of dirt and good electrical contact.

Fig. 2 shows a window connection or circuit-maker. The plate *A* is set into the casing so that the sash may in its opening movement slip over the cam-shaped lever *B* and press it so that the end *D* comes in contact with spring *C*. The spring *C* and plate *A* are connected with the two ends of the wire circuit as in the previously described cases. But the impact of *D* against *C* is not always as electrically certain as is desirable, therefore the improvement illustrated by Figure 4 is of interest because it is certain to make contact. The cam-lever *B* is pivoted at *H*, and has fastened to it the hemispherical button-head *E* of hard-rubber, or other insulating material. The spring *C* is bifurcated, and its two points make a scraping contact with the lever at *D* when it is pressed by raising the window sash. The spring presses on the button-head *E* when the sash is closed, and thus keeps the lever *B* in

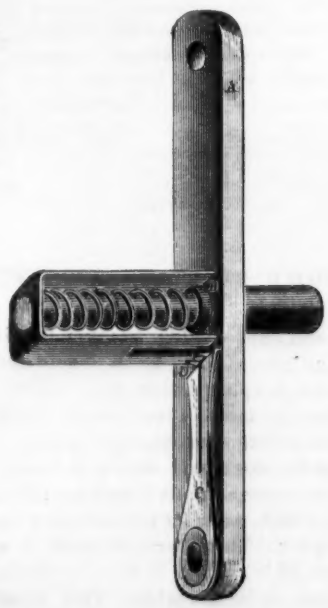


Fig. 3.

Fig. 4.

position out of contact with the points *D*. We heartily welcome such improvements, which, though they may seem simple in themselves, are of great importance in insuring correct and absolute working efficiency.

Improvements in Insulated Wire.

Electricians do not require to be informed that the perfect insulation of wire used in the transmission of a current is a matter of prime importance. They are aware that for the finer numbers of wire, used in making magnets, for example, silk has been the insulating material chiefly employed, and that at the present time it enjoys undiminished popularity. Silk is dear, however, and Mr. Henry Splitdorf, an ingenious inventor, whose name has long been prominently connected with the manufacture of insulated wire in this country, is now, under some of his latest patents, making, it is claimed, a thoroughly satisfactory wire insulated with cotton fibre. The question of cost is a serious one, and it is therefore noteworthy that raw Sea Island cotton fibre can be obtained for about 60 cents a pound, while silk practically costs, we believe, by the time it is put on, about $8 or $10 per pound. This is a great difference, and one that must tell in favor of the cotton fibre. But this is not all. Owing to the smoothness of silk it will sometimes happen that the threads wound around the wire do not present an impervious surface to the atmosphere, and the fact that there are minute openings or spaces between the threads is soon revealed, especially in wet weather, by the oxidation—the appearance of verdigris. If a super-covering be added, the wire is made thicker, the quantity of wire in a given compass is lessened, and hence the power of conductivity is reduced. The present method employed by Mr. Splitdorf certainly appears calculated to secure the greatest amount of conductivity, in spite of the familiar fact that cotton is not so good a non-conductor as silk. In the first place, Mr, Splitdorf passes his wire through a bath of shellac, which coats upon it, and forms at once an insulation impenetrable by moisture. Over this is wound the fibre, not in the shape of thread, but in such a way that, after the roving has been taken asunder or untwisted, the filaments are brought together again by the machine and overlap and cover up each other completely. The result is as if the wire had been pulled through a continuous pipe or sack of cotton. As soon as the spool of covered wire is full it is taken off and heat is applied so that in a second or two the covering adheres closely to the wire by means of the shellac lacquering. Then, as a last precaution, a rapid application is made of paraffine, not to soak in, but to form a surface coating. An orthodox green finish can then be given if desired.

The machine for covering is very ingenious in construction, and covers about 13 feet a minute to each spool. It is so simple, too, that it will run the whole day without watching or tending, except to supply the raw materials and remove the finished product. Mr. Splitdorf informs us that the wire thus made is giving the greatest satisfaction, it being neither bulkier nor heavier than the silk-wound wire, and being decidedly economical. Magnets made with it are applied to all the various electrical uses of the day. The machine and the processes are secured by patent in the United States, Great Britain, Germany and France, and appear highly deserving of development by capital. The Patent Rights of Great Britain, Germany and France are for sale. Mr. Splitdorf's factory is at 176 Worth street, this city.

Lava Electric Insulators.

In our last issue Mr. P. Atkinson, A. M., passed in review the best known insulators, dealing with their respective merits. We have now received from the D. M. Stewart Manufacturing Company, of 231 and 233 State avenue, Cincinnati, O., some samples of their patent "Lava" insulation. This new material looks like wood, but has the "feel" of slate. It can be cut or molded into any shape that the exigency of the case demands, before passing through the hardening process. It is extremely hard, offering great resistance to all cutting tools, and would stand, we think, any amount of wear. Among the points claimed in its favor are that it does not warp, that it is absolutely fireproof and waterproof, and that it is not soluble in any known acid. The pieces submitted are a tube for use where wire enters buildings, and a switch plug, and both are, we should judge, excellently adapted to their purpose. The firm quote the testimony of the Superintendent of the Brush Electric Light Co. at Cincinnati, to the effect that he has never had a fire or any trouble where the Lava insulators are in use, and that he is substituting them for others. It is evident that the range of application for this material is wide, and the firm say that they are already increasing their capacity for production.

The New York Electrical Society.

The regular meeting of the New York Electrical Society was held at the Cooper Institute on the evening of the 19th, and was well attended. Dr. Van der Weyde presided and briefly introduced the subject of discussion; "The Reversibility of the Electric Motor into Dynamo Machines." He mentioned an electric motor at the World's Fair here in 1853, made by the late Dr. Maurice Vergnes, in which the motive power was derived from 720 zinc and copper cells of two gallons capacity. Dr. N. S. Keith made an interesting address on the subject generally, and began by explaining the reversibility of the old Froment, Pacinotti and other machines. Mr. Pendleton read a translation of Pacinotti's letter to the Academy of Sciences, Paris, in 1871, in regard to his own and the Gramme machines and their reversibility. During the evening Mr. Fairman exhibited in operation a small incandescent lamp, about one inch long and three-eighths of an inch in diameter, for medical purposes.

The Associated Press—A Correction.

To the Editor of The Electrical World:

SIR: In an editorial article in your issue of the 15th inst., refering to my testimony before the Senate Committee, you put the following words into my mouth:

"As to the rates that should be charged, Mr. Smith made the following suggestion: 'I think that the telegraph companies should give a rate similar to the rate given by the British government—that is, they should charge so much for serving a place, and, if there is more than one paper there, that they should serve the additional papers, and that the rates should be given whether three points were served or 10; that it should be so much, and that the rates should be high enough to pay them for doing the work.' Being asked what would be the benefit of a regulation by act of Congress to the effect that all news transmitted for an association should be furnished at the same rates to all papers at the different points reached, he replied that it would give everybody a chance to live and do business; it would put everybody on the same basis, and then newspapers would be the same as the commercial patrons of the telegraph are now, with regard to rates."

This is an error. I made no such suggestion, but on the contrary pointed out the absurdity of such a plan as that embraced in the first clause of the above paragraph. I explained that the person who did make the suggestion did not understand the British system; that in this country the rate must be on the service rendered, and that the question of division of cost must be determined by the owners of the reports.

As to the second clause of the paragraph in your paper, I certainly did not say that it would be a good thing for Congress to pass an act to regulate the transmission of news reports. My argument was against the power of Congress to regulate the press business in any respect. Whence, I asked, is the power derived? Certainly not in the constitution, which guarantees the freedom of the press. That instrument does not give to Congress the power to create a private business. If the Legislature may not create a private business, it cannot regulate a private business. The newspaper business is as private in its property rights as any other business, and if we are to have governmental regulation in one, let us have it in all.

NEW YORK. WM. HENRY SMITH.

[We are glad to publish this explanation from Mr. Smith, as the meagre reports in most of the daily papers of his testimony were very confusing and mystifying. The language we put in his mouth was taken from the Boston *Herald*. A full report of Mr. Smith's examination will be found in the New York *Tribune* of March 8.—EDS.]

The Prospects of the New England Telephone Company.

Much interest is felt in the present condition and prospects of the New England Telephone Company, which is supposed to have reached the point where it must either borrow the means of extending its business or else must "pass" dividends for a season. The Boston *Herald* of the 15th explains and discusses the situation as follows:

The future of this company will be an interesting one to follow. It has reached a point where it must borrow for construction or sacrifice one or more dividends, and the policy of the company regarding this matter seems not to have been determined. Large holders of the stock and parties professing to be familiar with the contracts and business think the company can easily pay a quarterly dividend of 1 per cent. and carry on the construction from the surplus earnings, save a few thousand dollars per month, and in a brief time the increased earnings would take care of the construction and reduce the liabilities. But can the company do this and meet its obligations to the American Bell Company? The opinion obtains among students of the situation that in making the contract with the New England Company the Bell grasped the lion's share and will "kill the goose that lays the golden egg" if it insists upon fulfillment of the terms. It is known that the contract gives the Bell company from $14 to $20 per set per annum upon telephones, amounting to about $25,000 per month, beside a large percentage upon the business between towns. The Bell also holds one-half of the stock issued, which cost them nothing. The issued and dividend drawing capital is about $6,000,000, the full capital being $10,000,000. The Bell holds $2,000,000, representing its Boston property, and $4,000,000 is held by the stockholders of the former subordinate companies. The remaining $4,000,000 is held by the Bell for the franchise. Of this amount $1,300,000 is entitled to dividends by October, 1884, and the balance at the rate of $600,000 per year until the whole becomes dividend stock, which will be in seven years. With this dividend charge thus constantly increasing, and with constant demands for extensions and renewals, it looks like an uphill job for the New England company to make the telephone business of a subordinate organization particularly lucrative. However, this company is so prominently identified with the Bell, which controls it, that it should not lack for backing.

A CABLE REPAIRED.—The Duxbury-St. Pierre section of the Anglo-American cable, which has been interrupted for over three months, was repaired on the 9th by the steamer Minia.

THE TELEGRAPH.

SALE OF STOCK.—Ten shares of Mutual District Messenger Co., Boston, were sold last week for $125 per share.

THE WESTERN UNION CO. SELLING REAL ESTATE.—The Western Union Co. has sold a building on the west side of Broadway, just north of Dey street, to Harriet Hayden for $100,000.

THE DAYTON, O., DISTRICT TELEGRAPH CO.—The articles of incorporation have been filed for this company. The projector of it is Mr. A. E. Leitch, electrical engineer and contractor, of that city.

THE DELANY SYNCHRONOUS MULTIPLEX SYSTEM.—Mr. P. B. Delany described his new system of telegraphy before the Boston Society of Arts on the 13th inst. The system is soon to be tested between Boston and Providence.

STOCK EXCHANGE TICKERS.—New instruments have been experimentally placed in the long room of the Stock Exchange by the Stock Quotation Telegraph Company, and one in the trading room. It is claimed that the new instruments will send out quotations more rapidly than has ever been done before.

ELECTION OF TELEGRAPH OFFICERS.—At the annual meeting of the Bankers and Merchants' Telegraph Company, at Hartford, Conn., March 19, only routine business was transacted. The following directors were elected: C. W. Foster, J. G. Case, George E. Dimock, F. H. May, F. Morrison, A. N. Dimock, G. S. Mott, G. P. Smith, and John R. Hegeman.

ENGLISH SPEED IN SENDING.—A competition took place last month in London among some of the quickest operators. It appears that Mr. J. Chapman, of the London Stock Exchange, who was adjudged the winner, took 7 min. 50⅘ sec. to send his 250 words; Mr. J. Dennett, of the Central Telegraph office, who came second, sent the same quantity in 7 min. 30⅘ sec., whilst the time occupied by Mr. A. Brooker, of the same office, who was third, was 7 min. 48 sec. Morse instruments were used, and of course accuracy as well as dispatch was considered, hence Mr. Chapman, though not the fastest sender of the three winners, was the most accurate.

THE POSTAL COMPANY IN PHILADELPHIA.—The first office of the Postal Telegraph Company in Philadelphia was opened on the 19th for business at Third and Chestnut streets. A dozen branch offices in different parts of the city will be opened in a short time. The rates are 15 cents for 20 words to New York, Baltimore, and Washington, and 10 cents for each additional 10 words. The rate to Chicago, Cincinnati, Milwaukee, and points in New York State and the oil region of Pennsylvania is 25 cents for 20 words and 10 cents for each additional 10 words. The company now have about 15,000 miles of wire in use, and are rapidly extending their lines from Philadelphia, *via* Reading to Harrisburg, and thence to Pittsburgh, and from Chicago they are pushing west to St. Louis and Kansas City, and from New York east to Boston and other New England points, and they now reach Pittsburgh and the oil country by way of Buffalo.

THE TELEPHONE.

BELL DIVIDEND.—The Boston *Herald* says that the dividend on Bell telephone stock, made payable on April 15, is $3.

INTRODUCING THE 'PHONE AT EMMITSBURG, MD.—The Chesapeake and Potomac Telephone Company is reported by the local *Chronicle* to be engaged in introducing the telephone at Emmitsburg, Md. A great many subscribers have already been secured.

THE CINCINNATI TELEPHONE DIRECTORY.—The March issue of this Directory is a bulky publication. Evidently the exchange is doing a most flourishing business. Besides the subscribers, there are 70 public pay stations in Cincinnati, and the exchange has outside connections by toll lines with 243 towns and cities in Ohio, Indiana and Kentucky.

A VERY SUDDEN DEATH.—On Friday, March 14, Mr. Stephen MacDonald, manager of the telephone office 1,214 Cass avenue, St. Louis, dropped dead in the office as he was preparing to leave for home. He had been in excellent health, apparently, up to a few minutes before his death, when he complained of a slight pain in the region of his heart. He was a remarkably expert operator, and was held in high esteem by the officers and employés of the company for his many good qualities. He was only 20 years of age.

THE TELEPHONE IN MEXICO.—A certificate incorporating the Mexican National Telephone Company, 2d, was filed in this city on the 15th. The lines of the company are to run from this city across to New Jersey and thence southward to the City of Mexico, in as direct a line as practicable, and to such other localities in Mexico as the interests of the company may require. The capital stock of the company is $100,000, with authority to increase it to $1,000,000. The corporators are Adolfo Hegewisch, Everardo Hegewisch, Theodore C. Gross and Ernest Otten.

CHANGES AT ELGIN, ILL.—Various improvements have been made in the Elgin, Ill., telephone exchange by Mr. Hubbard, the manager, the apparatus now in use being the latest and most complete obtainable. There are now 128 local subscribers and five toll lines, by which direct calls and connections are made from 14 toll stations, making altogether 142 parties who connect directly with the office. Elgin is of great importance as the central office for the northwest toll and Chicago connections, joining at Rockford and Lake Geneva with the Central Union and WisconsinCo.'s system. It is the intention, as soon as possible, to build a new copper wire from Chicago to Elgin, which, it is thought, will render better facilities all through, and accommodate the rapidly-growing business more completely; also other toll line connections will be gradually added as requirements will warrant.

Mr. W. F. BLACK, of Worcester, Mass., who has been for a long time connected with the telephone interests there, has tendered his resignation as Superintendent of the Worcester Division of the New England Telephone and Telegraph Company. This change is to take effect April 1. Mr. Black has accepted an appointment as General Cashier of the Northwestern Division of the Erie Telegraph and Telephone Company with headquarters at Minneapolis, Minn. The territory covered by this division is Minnesota, part of Wisconsin and all of Dakota. Mr. Black has had charge, in a great measure, of all of the trunk lines in that section of the State. By his tact for business and his gentlemanly manner he has made a host of friends, who, while regreting his departure from his present position, congratulate him on his appointment to a more lucrative one elsewhere.

THE ELECTRIC LIGHT.

IT has been observed that at Jacksonville, Fla., the electric lights attract the colored people as a candle attracts moths.

THE INCANDESCENT LIGHT IN A PAPER MILL.—The first incandescent light installation at Dayton, Ohio, is that made at the paper mill of C. L. Hawes. It consists of 100 Edison lamps.

THE ELECTRIC HEADLIGHT.—It is stated the Pennsylvania Railroad Company proposes to put on all its engines the Indiana electric headlight, of which more than one description has appeared in our columns.

THE EDISON LIGHT IN A HOSPITAL.—In the Hôtel Dieu, the largest hospital in Paris, is to be introduced experimentally in the halls occupied by patients the Edison system of incandescent lights. The institution is already provided with Gramme electrical generators and a steam engine.

SEDALIA, MO., AND LINCOLN, ILL.—The electric light company at Sedalia, Mo, has adopted the Excelsior system, purchased through the Western agent, Mr. F. W. Horne, of Chicago. The electric light company at Lincoln, Ill., has adopted the Van Depoele system, and will start with 40 lights. For the first installation a 60-h. p. Ide engine has been purchased, and for the second a 50-h. p. engine.

THE THOMSON-HOUSTON SYSTEM IN THE WEST.—A special dispatch from Chicago says that a company with half a million capital is being formed there by some prominent capitalists hitherto largely interested in electrical matters, to construct and apply Thomson-Houston electric lighting plants in the Northwest, as is being done in the East by the American Electric and Illuminating Company of Boston.

ABOUT 400 FEET IN THE AIR.—The Washington monument commission have recently given permission to the Brush-Swan Electric Light Company to place ten electric lights on the top o the monument for a period of two weeks. It is stipulated that the lights are to be removed by the first of April. The exhibition will commence probably on Saturday night, the 22d inst. W believe that the height of the monument is now about 400 feet.

THE JENNEY LIGHT AT FORT WAYNE, IND.—The Common Council of Fort Wayne, Ind., has made a contract with the Jenney Company for an installation of not less than 100 double arc lamps for one year, to cost $11,000. Five lights will be placed on each of nine towers 120 feet high. The plant of the Jenney Electric Light and Power Company is situated at Fort Wayne, and gives employment to over 100 skilled employés, whose wages amount to $5,000 a month.

PRINTING MESSAGES TRANSMITTED BY LIGHT.—In a recent number of the *Comptes Rendus* there is a description by M. Martin de Brettes of an apparatus which prints messages transmitted by light. The rays from the electric arc, made parallel by a Mangin projector, would be sent from one station and would be received at the other end on a converging lens, in the focus of which is a selenium cell. This cell is in circuit with a local battery, and the receiving instrument is so adjusted that the change of resistance produced in the selenium cell by the action of light would alter the amount of current passing, and so act on the electro-magnet of the receiver.

ELECTRIC LIGHTHOUSES FOR OUR COAST.—A large lighthouse with a light of the first order has been erected at the Lighthouse Department Depot, Tompkinsville, S. I., to test the practicability of the electric light for lighthouses. All the appliances, including engines and generators, are prepared and waiting for globes to arrive from France. General Duane, in charge of the lighthouse station at Tompkinsville, says that when the new light is put in operation experts will be sent to a point on Long Island equidistant from the Tompkinsville electric light and the Highlands light. Both of these lights are of the first order, or the largest made. The Highlands light burns oil. The experts will determine which light is the better for penetration of distance and for distinctness. Electricity would cost, it is said, ten times as much as oil, because duplicates would be necessary of all the apparatus, while the supplies of coal, water and needed articles would require double supply service, owing to the isolated position of lighthouses.

ELECTRIC LIGHT INTERESTS IN CANADA.—The American Electric & Illuminating Company, which some three months since bought the sole rights for the Dominion of Canada to the Thomson-Houston system of electric lighting, together with a large factory for the manufacture of the apparatus, in Montreal, has just sold the entire business and property to a new company of Canadian capitalists at a handsome advance. The officers of the American company in Boston state that having purchased the property and franchises at a very low figure when in an undeveloped state, and having brought it up by the expenditure of a good deal of money, work and energy, they are now enabled to dispose of it at a remunerative price, and to devote their own energies to the extension of their business in the United States. At the same time the Canadian company, which is to be known as the Royal Electric Company, and which starts off with a capital of $250,000, obtains a valuable property at a reasonable price, and the two companies will work in close relations and mutual participation in future inventions secured by either.

MISCELLANEOUS NOTES.

ERRATUM.—In the third line of the sixth paragraph of the article by Mr. P. Atkinson, A. M., on insulators, published week, the word "pressure" should read "resistance."

UNDERGROUND CONDUITS.—Articles of incorporation of Globe Electric and Underground Conduit Company were filed in the New York County Clerk's office on the 17th. The company is to manufacture, buy and sell electrical conductors and to construct underground conduits for electrical purposes. Its capital

stock is $2,000,000, divided into 200,000 shares of $10 each. Its incorporators are J. Clayton Erb and William D. Neilson, of Philadelphia, and J. Morris Welch, George R. Cinnamond and Charles Reynolds Logan, of this city.

THE CHAPMAN ELECTRIC MOTOR COMPANY.—Siegmund T. Meyer, Asher T. Meyer, Charles C. Peck, William H. Chapman, and Philip L. Meyer are the corporators of the Chapman Electric Motor Company, whose certificate of incorporation was filed in the County Clerk's office, New York, on the 17th. The new company is to acquire legal title to certain letters patent for improvements in electric motors, electric generators, electro-magnetic apparatus and commutators; to build such apparatus and apply them to all the uses to which they are suited, or to license others so to apply them. The capital stock is fixed at $500,000. The company proposes to manufacture an electric motor for which patents have been obtained by William H. Chapman. It differs from other motors in that the armatures are brought into a close contact with the magnet. The motors are to be light; one that will draw a car will weigh only 150 pounds. "The cross town routes laid out by the Rapid Transit Commissioners would be especially adapted to the use of such motors," says an interested corporator. A factory will probably be built in East Thirteenth street.

THE PROGRESS OF THE JARVIS ENGINEERING COMPANY.—Few companies making steam machinery and appliances have enjoyed greater prosperity of late years than the Jarvis Engineering Company of Boston. They removed on the 18th inst., from their old quarters at 7 Oliver street to 61 Oliver street, where they will now be glad to see old friends and customers. They propose to represent only the best specialties in the line of steam supplies, and are prepared to furnish and put up at short notice complete steam plants. Having the agency of the Jarvis Patent Furnace, Armington & Sims Engine, Schutte & Goehring's Jet Apparatus (consisting of the Korting Injectors, Induction Condensers, Air Compressors and Exhausters, Siphon Pumps, etc.), Sheffield Grate Bars, National Feed-water Heaters, Steam Pumps, etc., they are enabled to erect complete outfits of motive power at a low price. Their mason work will be under the charge of Mr. H. W. Leach, and the engine business will be managed by Mr. L. B. Wright. They do not propose to confine themselves to local business, but will be prepared to erect steam plants at any point in the United States, Mexico, West Indies or Sandwich Islands.

STOCK QUOTATIONS.

Telegraph, telephone and electric light stocks were quoted as follows on Thursday at the Electric, Manufacturing and Miscellaneous Stock Exchange, and at the Stock Exchange:

TELEGRAPH.—Am. Cable, b 57; Am. R., b 50, a 65; B. & M. Co., a 126; Commercial Telegram Co., a 80; Harlem Dist. Co., a 5½; Manhattan, b 10, a 85; Mexican, b 125, a 147; Mut. Union, b 16, a 17; Northern & Southern Co. bonds (1st), b 79, a 81; Postal (stock), b 6¾, a 7¼; Postal bonds (1st, 6 per cent.), b 57, a 57½; Postal Telegraph and Cable Co., a 14½; Western Union, b 73½, a 73⅝.

The net earnings of the Mexican Telegraph Company for the week ended March 15 were $5,770, and those of the Central & South American Company about $13,750.

TELEPHONE.—American Bell, b 165, a 167; American Speaking, b 110, a 125; Currier Telephone Bell, b 3; Colombia and Panama, b 23½, a 25; Continental, b 12; Dolbear, b 5, a 10; Globe, b 9, a 11; Hudson River, b 60, a 100; Inter-Continental, b 75; Mexican, b 2¼, a 2¾; Mexican Central, a 3; Molecular, b 5, a 6; New England, a 36; New York, a 85; New York and New Jersey, a 85; New York and Pennsylvania, b 50, a 78; Overland, b 8, a 17; People's, b 10, a 15; Peoples (N. E.), b 1½; Shaw, b 10; Solenoid, a 125; Southern Bell, b 95, a 125; Southern New England, a 175; Tropical, b 1.40, a 2; West India Telegraph and Telephone, b 1.90, a 2.

Our Chicago correspondent sends the following as of the 18th inst.: Central Union, b 40, a 65; Michigan, b 100, a 105; Mo. & Kansas, b 73, a 76; United, b 73, a 76; Wisconsin, b 105, a 115; Interstate, a 50; Chicago, b 285, a 300; Iowa Union, b 75 a 80.

The annual meeting of the Bell Telephone will be held in the Meionaon, Boston, March 25, to elect officers and act upon an amendment to the by-laws calling the annual meeting for the third Tuesday of February instead of the last Tuesday of March. The transfer books close the 20th to the 25th, inclusive.

The Boston *Herald* of the 20th reports the telephone market as follows: Telephone shares are quiet and firm, Bell at 170@173; New England at 33¾@34; Erie at 33⅛@33¾, and Mexican at 2 3-16. The closing of the Bell books tends to make that stock stroug.

ELECTRIC LIGHT.—American, b 2, a 4; Brush, b 50, a 80; Brush Illuminating, b 45, a 70; Daft, a 65; Edison, b 136, a 145; Edison Illuminating, b 55, a 75; Edison Isolated, b 55, a 90; Edison European, b 3, a 15; Excelsior, b 20; Swan Incandescent, a 40; United States, b 95, a 110.

BUSINESS NOTICES.

MCGONEGAL & LAKE.—This firm, of 25 Temple Court, New York City, make a specialty of furnishing all kinds of supplies to district telegraph companies, and they also supply competent men as superintendents, managers, clerks and linemen for district telegraph and telephone purposes. They also execute commissions, buying and selling telegraph and telephone stock or territory. Information and advice are given free. Correspondence is solicited.

A. B. LYMAN & CO.'S CATALOGUE.—The latest catalogue issued by A. B. Lyman & Co., 36 South Water street, Cleveland, O., is at once an excellent manual of telegraphy and a full descriptive price list. The information given is very clear and explicit, and the prices quoted are most reasonable. The catalogue is 52 pages, profusely illustrated, in neat cover, and goes over the whole ground of telegraph annunciators, burglar alarms, medial batteries, and electrical supplies for which the firm have so long enjoyed the highest reputation.

OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

Edited by N. S. KEITH, Electrical Engineer and Expert, 237 Broadway, New York.

PATENTS DATED MARCH 4, 1884.

Apparatus for Drawing Telegraph-Cables into Pipes; William R. Patterson, of Chicago, Ill., assignor to the Western Electric Co., of same place 294,500

The cables may be of any length, say 1,000 feet; while the sections of pipe are about 100 feet in length. Does away with repeated coiling and uncoiling, and facilitates the operation.

Automatic Electric Cut-Out; Charles S. Pinkham, of Philadelphia, Pa., assignor of one-half to James J. Seal, of same place..... 294,404

Combines a closed circuit and an open-circuit apparatus, so that the closed-circuit apparatus automatically opens the other circuit in a short time after being closed by its necessary use.

Automatic Cut-Out for Electro-Magnetic Helices; Frank L. Pope, of Elizabeth, N. J. 294,669

Consists in using two helices on the same magnet-core. One is in use when the armature is at its greatest distance; but as it approaches the magnet it automatically substitutes the other helix which has much greater resistance, but has equal effect upon the armature by reason of the lessened distance. The object being to save unnecessary waste in the battery.

Battery; Alfred Haid, of Rahway, N. J..... 294,463

Prussian blue is used as the depolarizing agent in contact with a carbon negative plate in a porous cell. Salammoniac solution is the battery liquid and zinc the positive element. This battery may be regenerated by passing electric current through it in the reverse direction.

Compound Electric Cable; Richard S. Waring, of Pittsburgh, Pa 294,538

A compound arrangement of the wires as described in No. 294,536.

Compound Electric Cable; Richard S. Waring, of Pittsburgh, Penn..... 294,536

Consists of a cable having its insulated conducting wires inclosed in separate tubular passages in a common body of metal, such as lead. Two rows of wires are put in the body of lead, and so arranged that the adjacent wires of the two rows are nearer together than are the wires of the respective rows.

Commutator for Magnets or Dynamo-Electric Machines; Zénobe Théophile Gramme, of Paris, France..... 294,613

Consists in the combination, with the sockets or carriers for the brushes, of a common support with which the sockets or carriers are movably connected, and operating devices also carried by a common support for simultaneously shifting the sockets or carriers.

Combined Gas and Electric Light Fixture; Luther Stieringer, of New York, N. Y.....294,697

The wires are placed along the sides of the pipes and fittings, and all are then covered by ornamental tube and shell work to hide the wires.

Conduit for Underground Electric Wires; Henry B. Cobb, of Wilmington, Del..... 294,365

Consists of a coupling for the conduit pipes; and this coupling is provided with one or more branch outlets, like a tee, for connecting the wires with branches.

Dynamo-Electric Machine; George W. Fuller, of Norwich, Conn 294,458

The conductor-bars of the armature are made into a form resembling a cylindrical cage, and they are passed through, by rotation, the intense magnetic-field produced by the usual field-magnet pole-faces and a cylindrical iron core kept stationary within the cage or armature.

Dynamo-Electric Machine; Robert J. Sheehy, of New York, N. Y..... 294,688

Two armatures are rotated, each in a field of one polarity only, but of opposite character. The armatures are compound ones, each consisting of one metal ring acting as a carrier for two annular cores, one on each side. The bobbins are arranged so that they alternate in order upon either of the two rings, so that the amount of inductive wire in the field is nearly constant. The impulses of currents from the two armatures are made to pass to the external circuit in succession, alternatively, so that a nearer approach to continuity is made.

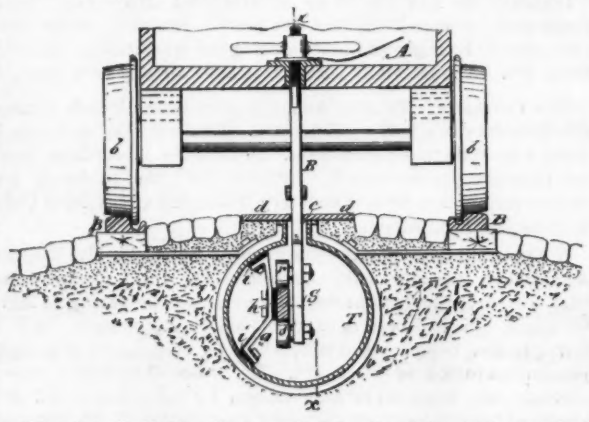
Electric Arc Lamp; Hardman Arthur Earle, of London, England, and Ewald Goldstein, of Hanover, Prussia, Germany..... 294,455

The length of arc is regulated by the flow of a liquid controlled by an electro-magnet. The electro-magnet or solenoid actuates a piston which by its movement separates the carbons to form the arc; and then the piston acts as a valve to control the flow of liquid from a piston-cylinder to a reservoir. The movement of the second piston in its cylinder, due to the flow of liquid from under it, communicates a feed-movement to one or both of the carbons.

Electric Arc Lamp; Charles J. Van Depoele, of Chicago, Ill..... 294,532

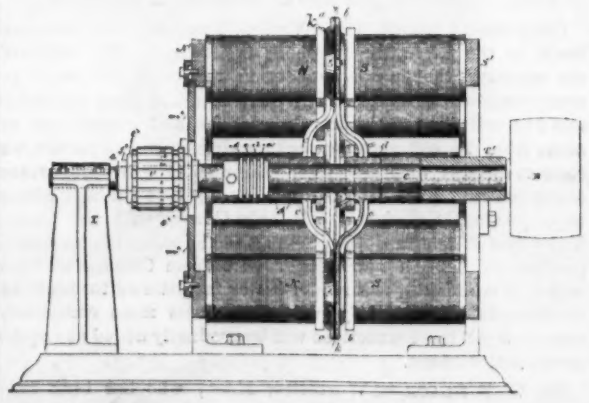
The regulation is effected by vibrating armatures which, when vibrated energetically by reason of increased difference of potential due to a long arc, make electrical shunt contacts and thus demagnetize magnets which hold the carbon carriers. This condition allows the feed movement of the carbons.

Grip for Electric Cars; John Carlos Henderson, of New York, N. Y..... 294,618



S is a longitudinal rail supported in the tube *T* by brackets like *g* which are insulated as at *h* and *i i*. Reaching downward from the car through a slot in the plate *d d* is the tightening-rod *R*, which carries the rollers *r* and *s*, which engage with the rail. By suitably raising the rod *R* the pressure of the car upon the rails *B B* may be increased. The rail *S* may be used as one of the conductors of electricity.

Dynamo-Electric Machine; Clinton M. Ball, of Troy, N. Y., assignor of two-thirds to John McKenzie, of West Troy, and Joseph Powers, of Lansingburg, N. Y..... 294,719



Makes use of a revolving armature-disc or wheel having recesses that receive the induction coils *K*, or helices, or bobbins, such recesses being of an interior shape corresponding to the shape of the coil, and tapered or larger at the inner part of the disc than at the outer part, so as to retain the coils within the discs. Two discs, *a* and *b*, setting back to back, are placed so that the coils alternate in position, and the connections are taken off to commutator bars peculiarly constructed.

Electric Lamp; Charles J. Van Depoele, of Chicago, Ill..... 294,533

The arc is formed and the feed effected by an annular armature of an electric motor. The necessary changes in direction of motion are made by the movements of the brushes of the motor made by two separate magnet solenoids in the main and derived circuits respectively.

Electric Cable; Richard S. Waring, of Pittsburgh, Pa 294,541

Consists of a cable having a soft-metal body, of rounded form, with passages therethrough inclosing insulated conducting wires, such wires being arranged at equal intervals around the soft-metal core or centre.

Electric Cable; Richard S. Waring, of Pittsburgh, Pa..... 294,543

A compound arrangement of the wires as described in No. 294,541.

Electric Cable; Richard S. Waring of Pittsburgh, Pa. 294,545

Consists of a cable having a solid, as distinguished from a tubular, body of soft, ductile metal inclosing insulated conducting wires, and also strengthening wires arranged in circular order around the insulated conducting-wires.

Electric Motor; Murray Bacon, of Philadelphia, Pa., assignor to the Novelty Electric Co., of same place... 294,717

Consists in the frame which supports the electro-magnets and armature. It is of an inverted U form.

Insulator for Electric Wires; William W. Beach, of New York, N. Y 294,563

Consists in a block provided with transverse grooves for receiving the wires, and with a frame having tongues fitting in the grooves, when the frame is passed over the block provided with the grooves.

Insulator for Electric Conductors; Albert W. Hale, of Plainfield, N. J..... 294,384

A metallic hook is covered with a glaze; and this glaze is then covered by a metallic coating.

Making Joint Connections in Electric Cables; Richard S. Waring, of Pittsburgh, Pa..... 294,546

Consists in removing the lead covering from a wire of the cable, severing it, removing the insulating covering, and making electrical connection between such ends and the exposed ends of the wires of the branch cable, then re-covering the exposed metallic surfaces of the conductors with electric insulating material, and inclosing the whole in a wiped joint of solder.

Repairing the Defects in the Conductors of Lead Cables; Richard S. Waring, of Pittsburg, Pa..... 294,549

Consists in uncovering one of the conductors of a lead-covered electric cable, having two or more conductors inclosed in separate passages in the lead covering, severing the conductor, electrically uniting the severed ends, covering said union with insulating material, and recovering the union with lead.

Secondary Battery; Alfred Haid, of Rahway, N. J., assignor, by direct and mesne assignments, to Haid's Electrical Storage Co., of Newark, N. J..... 294,464

Zinc and carbon electrodes are used in an acid solution of sulphate of zinc and sulphate of manganese.

Secondary Battery; Alfred Haid, of Rahway, N. J., assignor, by direct and mesne assignments, to Haid's Electical Storage Co., of Newark, N. J..... 294,465

Lead plates for storage batteries are prepared for use by first coating them with zinc, and then dissolving the coating off prior to the "forming" process.

Telephone Central-Office Apparatus; Felton M. Lytle and John A. McCoy, of Baltimore, Md., assignor to Henry B. Lytle, of Boston, Mass., Trustee 294,482

Various devices in combination for facilitating operations in a telephone exchange.

Underground Conduit for Electric Conductors; Edemond Verstraete, of Chicago, Ill..... 294,703

The conduit is built at the shop in sections containing the wires, and then, when put in place, the ends of the wires of the several sections are suitably connected, and the spaces between the sections are filled with some of the same kind of cement as the sections are made of. This cement is composed of four parts of rosin, two parts of whiting or plaster-of-Paris, and one part of sawdust, made hot enough to be fluid or plastic.